Date: September 15, 2009

Title: Proportions (section 2.1)

Objective: Discover missing information using proportions.

IN: What are the three ways to write a proportion?

Fractions

With a colon (:)

With the word "to"

Quick Practice!

Put the following sentence into three different versions of the ratio:

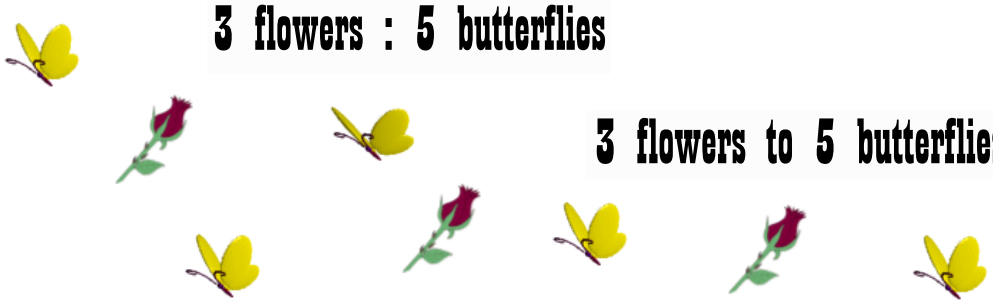
For every 3 flowers, there are 5 butterflies.

And the answers are...

$$\frac{\text{3 flowers}}{\text{5 butterflies}}$$

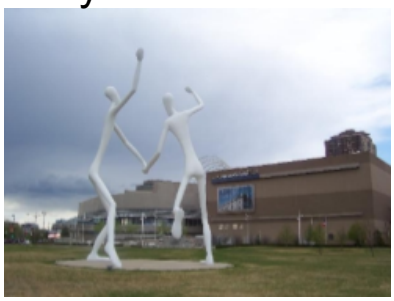
3 flowers : 5 butterflies

3 flowers to 5 butterflies



Interesting Facts!

Ratios are all around you!



-The black bear is generally 2/3 the size of a human being (black bears are found in Colorado).

-The artist of the blue bear in Denver (in front of the convention center), stayed true to those dimensions and made the bear 2/3 the height of the dancing people (in front of the performing arts center in Denver) .

Vocabulary/ideas for your interactive notebook

Proportion:

A proportion is an equation stating that two ratios are equal.

Variable:

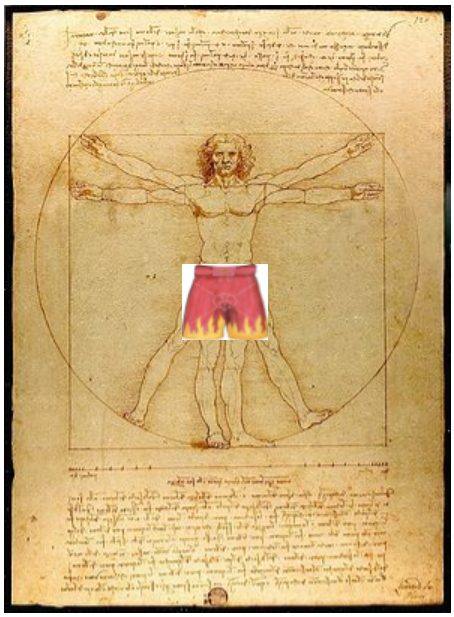
A variable is a symbol other than a number, that represents an unknown number.

Fractions:

Fractions can show division. For example, 3/4 can mean 3 divided by 4.

Proportions:

The Vitruvian man was drawn by Leonardo da Vinci.
It is an example of what a proportional man/woman should look like.
The arm span is shown to be 1 to 1 (can be written as 1:1).



Proportions Continued

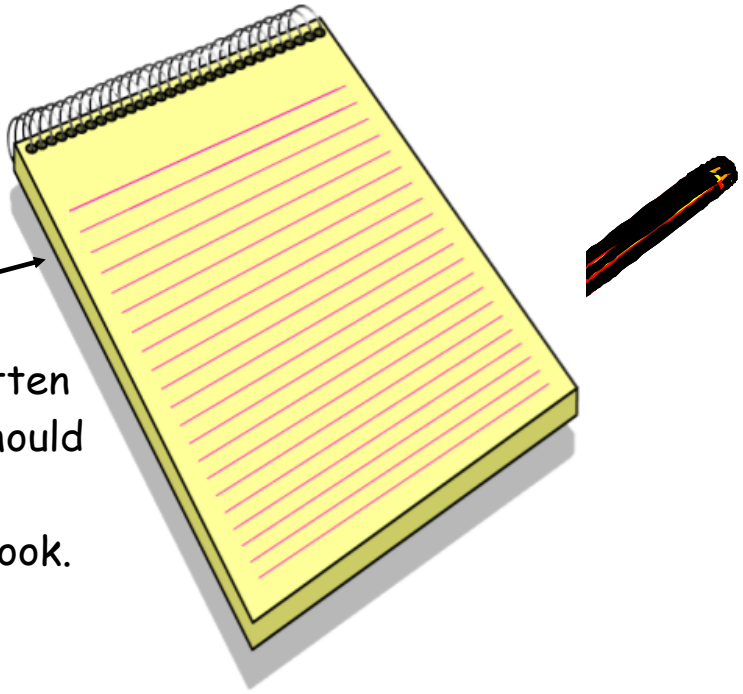
Two fractions are proportional if they are equal in value.

Tell whether the following four are proportional or not in your interactive notebook.

$$\frac{2}{3}=\frac{8}{12} \qquad \frac{3}{2}=\frac{12}{8} \qquad \frac{3}{12}=\frac{2}{8} \qquad \frac{12}{3}=\frac{8}{2}$$

After writing your answer down, turn to the person next to you and tell them how you figured this out.

What are the ways you showed that the fractions were pro ?



The methods written on the notepad should be written in you interactive notebook.

2.1 Investigation • Multiply and Conquer

You can easily guess the value of M in the proportion $\frac{2}{3} = \frac{M}{6}$. In this investigation you'll examine ways to solve a proportion for an unknown number when guessing is not easy. It's hard to guess the value of M in the proportion $\frac{M}{19} = \frac{56}{133}$.

Step 1 Multiply both sides of the proportion $\frac{M}{19} = \frac{53}{133}$ by 19. Why can you do this? What does M equal?

Step 2 For each equation, choose a number to multiply both ratios by to solve the proportion for the unknown number. Then multiply and divide to find the missing value.

a. $\frac{p}{12} = \frac{132}{176}$

b. $\frac{21}{35} = \frac{Q}{20}$

c. $\frac{L}{30} = \frac{30}{200}$

d. $\frac{130}{78} = \frac{n}{15}$

Step 3 Check that each proportion in Step 2 is true by replacing the variable with your answer.

Step 4 In each equation in Step 2, the variables are in the numerator. Write a brief explanation of one way to solve a proportion when one of the numerators is a variable.

Step 5 The proportions you solved in Step 2 have been changed by switching the numerators and denominators. That is, the ratio on each side has been *inverted*. (You may recall that inverted fractions, like $\frac{p}{12}$ and $\frac{12}{p}$ are called *reciprocals*.) Do the solutions from Step 2 also make these new proportions true?

a. $\frac{12}{p} = \frac{176}{132}$ **b.** $\frac{35}{21} = \frac{20}{Q}$ **c.** $\frac{30}{L} = \frac{200}{30}$ **d.** $\frac{78}{130} = \frac{15}{n}$

Step 6 How can you use what you just discovered to help you solve a proportion that has the variable in the denominator, such as $\frac{20}{135} = \frac{12}{k}$? Why does this work? Solve the equation.

Step 7 There are many ways to solve proportions. Here are three student papers each answering the question "13 is 65% of what number?" What are the steps each student followed? What other methods can you use to solve proportions?

a.

$\frac{65}{100} = \frac{13}{x}$

$\frac{100}{65} = \frac{x}{13}$

$\frac{13}{1} \cdot \frac{100}{65} = \frac{x}{13} \cdot \frac{13}{1}$

$20 = x$

b.

$\frac{65}{100} = \frac{13}{x}$

$\frac{13}{\cancel{65}\ \cancel{100}\ 20} = \frac{13}{x}$

$20 = x$

c.

$\frac{65}{100} = \frac{13}{x}$

$\frac{\cancel{100}}{\cancel{1}} \cdot \frac{x}{1} \cdot \frac{\cancel{65}}{\cancel{100}} = \frac{13}{\cancel{x}} \cdot \frac{\cancel{100}}{1} \cdot \frac{\cancel{x}}{1}$

$\frac{\cancel{65}x}{\cancel{65}} = \frac{1300}{65}$

$x = 20$

APPLICATION Jeremy has a job at the movie theater. His hourly wage is $7.38. Suppose 15% of his income is withheld for taxes and Social Security.

a. What percent does Jeremy get to keep?
b. What is his hourly take-home wage?

Try this on your own for 1 minute. When the timer beeps, turn to a neighbor and see if you got the same result.

Homework: Page 99
2,5 and #9

SUMMARY:
The most confusing thing about proportions at this point is...

OUT:
Explain how to tell whether two fractions are truly proportional.